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United States Patent

[19]

Denison et al.

Date of Patent: [45]

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FOREIGN PATENT DOCUMENTS

0517548 A2 12/1992 European Pat. Off.
0599730 A2 6/1994 European Pat. Off.

OTHER PUBLICATIONS

Preparation of SiO₂ Films With Low Dielectric Constant by ECR Plasma CVD, T. Fukuda et al., (Feb. 21-22, 1995), DUMIC Conference, pp. 43-46.
High Density Plasma Deposition and Deep Submicron Gap Fill With Low Dielectric Constant SiO₂ Films, L.Q. Qian et al., (Feb. 21-22, 1995), DUMIC Conference, pp. 50-56.
Dual Frequency Plasma CVD Fluorosilicate Glass Water Absorption and Stability, M.J. Shapiro et al., (Feb. 21-22, 1995), DUMIC Conference, pp. 118-123.

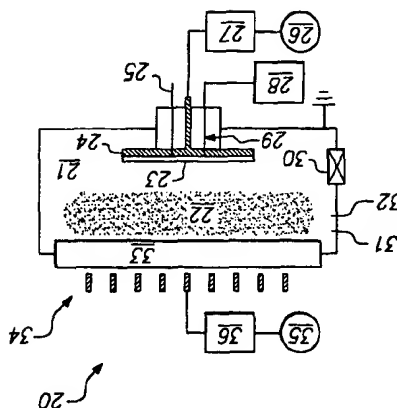
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ABSTRACT

A process of preparing a moisture-resistant fluorine containing silicon oxide film includes steps of supplying reactant gases containing silicon, oxygen and fluorine into a process chamber and generating plasma in the process chamber, supporting a substrate on a substrate support in the process chamber and growing a fluorine-containing silicon oxide film on the substrate by contacting the substrate with the plasma while maintaining temperature of the film above 300° C. The silicon and fluorine reactants can be supplied by separate gases such as SiH₄ and SiF₄ or as a single SiF₄ gas and the oxygen reactant can be supplied in a gas flow ratio of SiH₄/(SiH₄+SiF₄) of no greater than 0.5. The process can provide a film with a fluorine content of 2-12 atomic percent and argon can be included in the plasma to assist in gap filling. The plasma can be a high density plasma produced in an ECR, TCR, or ICP reactor and the substrate can be a silicon wafer including one or more metal layers over which the fluorine-containing silicon oxide film is deposited. The substrate support can include a gas passage which supplies a temperature control gas into a space between opposed surfaces of the substrate and the substrate support for maintaining the substrate at a desired temperature.

16 Claims, 2 Drawing Sheets



[54] METHOD FOR DEPOSITING FLUORINE DOPED SILICON DIOXIDE FILMS

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[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

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[51] Int. Cl.⁷ H01L 21/02; H05H 1/24
[52] U.S. Cl. 427/579, 427/563, 427/574, 438/788
[58] Field of Search 427/579, 573, 437/238, 438/788, 789

References Cited

U.S. PATENT DOCUMENTS

3,993,509 11/1976 McGinty
4,328,646 5/1982 Kaganowicz
4,340,462 7/1982 Koch
4,384,918 5/1983 Abe
4,401,054 8/1983 Matsuo et al.
4,401,504 8/1983 Kobayashi
4,902,934 2/1990 Miyamura et al.
4,948,458 8/1990 Ogil
5,200,232 4/1993 Tapan et al.
5,429,995 7/1995 Nishiyama et al.
5,492,736 2/1996 Laxman et al.
5,571,571 11/1996 Musaka et al.
5,571,576 11/1996 Qian et al.
5,571,578 11/1996 Kajl et al.
5,750,211 5/1998 Weise et al.
5,827,785 10/1998 Bhan et al.
5,869,149 2/1999 Denison et al.
5,872,065 2/1999 Sivaramakrishnan
5,937,232 8/1999 Orczyk et al.
5,948,485 9/1999 Amano et al.